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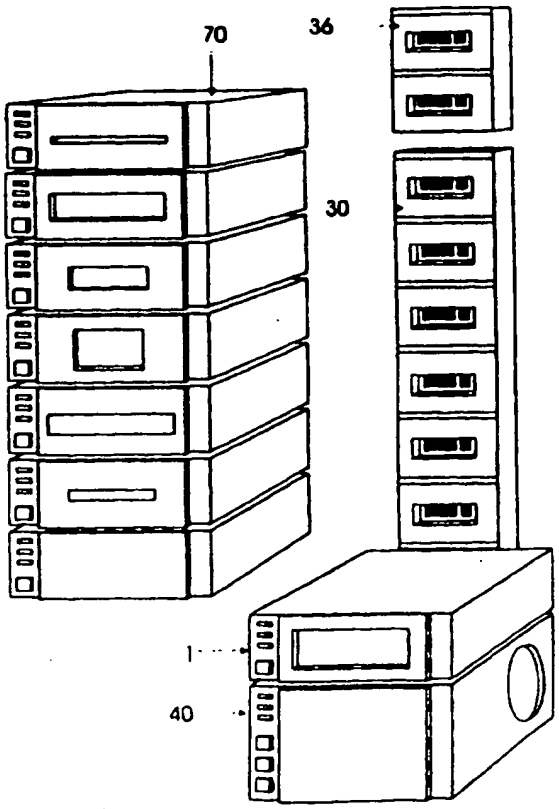
(54) Title: SINGLE COMPUTER CONTROL SYSTEM FOR A WIDE RANGE OF ELECTRONIC DEVICES

(57) Abstract

A computer control system for home use comprises an interface unit (30) and separately cased control and power supply units (1, 40) for detachable connection to the interface unit (30). A series of individually cased device units (70), such as personal computer peripherals, communication devices, entertainment devices and house automation subsystems, may be detachably connected to the interface unit (30) so as to be controlled by the control unit (1) and supplied with power by the power supply unit (40). This permits the various device units (70) to be controlled in such a way that the units may communicate with one another so as to enable, for example, a signal received over a telephone to be used to control a home security system. Since only a single control unit and a single power supply unit are required, there is a cost saving as compared with the case where each device unit has its own control section and power supply section, and additionally it is a simple matter for an average home user with no special technical skills to assemble the devices and to upgrade them if required.



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SINGLE COMPUTER CONTROL SYSTEM FOR A WIDE RANGE OF ELECTRONIC DEVICES

This invention relates to computer control systems, and is more particularly concerned with computer control systems for controlling a plurality of business and entertainment devices by means of a common control unit.

Personal computers are widely used in a home environment, and such computers commonly comprise a mother board, a processor, a display and one or more peripheral devices, such as a printer, a hard disk drive, a floppy disk drive or a CD ROM player. Many other electronic devices are also used in the home, such as telephones, telefax machines, answering machines, televisions, video recorders, hi-fi systems, home security systems, etc. Whilst it is known to connect at least some of these devices to a personal computer to enable control of the devices by the computer, there are considerable difficulties in doing this with most devices commonly used in the home due to the lack of compatibility between such devices and personal computers.

It is an object of the invention to provide a novel computer control system which is capable of controlling a wide range of electronic devices used in the home as well as in the office.

According to the present invention there is provided a computer control system as defined in the accompanying claims, as well as a series of device units which are adapted to be connected to such a system so as to be controlled and

supplied with power by the system.

It is envisaged that a new computer control system in accordance with the invention will be designed to control at least some of the following device units: personal computer peripherals, such as a hard disk drive, a, floppy disk drive, a CD ROM drive, a tape drive, and various I/O adapter cards; communication devices, such as a telephone, a telefax machine, a modem, a telephone answering machine, and a conferencing device; entertainment devices, such as a television/cable receiver, a radio receiver, a video recorder, a video on demand device and a hi-fi system; and house automation subsystems, such as a light control, heating control, and security subsystem. All such device units may be controlled by a single control unit and supplied with power by a single power supply unit.

This not only enable the various device units to be controlled in such a way that the units may communicate with one another and interact so as, for example, to enable a message on a sound file from the computer to be transmitted by way of the telephone, or to enable a signal received over the telephone to be used to control a home security system, but also results in a magnitude of home applications to be developed using the synergy between the devices. Furthermore it results in cost saving in that only a single control unit and a single power supply unit are required for the complete system.

Preferably the device units, the control unit and the power supply unit are all individually cased, and are designed to be plugged into the interface unit, so that

the user can assemble the units as required, and can interchange and upgrade units, including the control unit and the power supply as required, without any need for specialist technical knowledge.

It is envisaged that a new Home System Standard (HSS) will be created to which all system units will need to conform to enable full intercommunication between the units of the system. Similarly the construction packaging from of the individual modules will need to be standardised to enable the user to assemble and upgrade the modules to from the overall system. Preferably the device units and the control unit are cased so as to be of the same overall size and shape to save on production costs.

In order that the invention may be more fully understood, a preferred computer control system in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figures 1, 2 and 3 are schematic diagrams illustrating the construction of the control unit of the system;

Figure 4 is a schematic diagram illustrating the construction of the interface unit of the system;

Figure 5 is a schematic diagram illustrating the construction of the power supply unit of the system;

Figure 6 is a schematic diagram illustrating the connection of the control unit, the power supply unit and the device units to the interface unit;

Figure 7 is a schematic diagram illustrating the connection of the system units to an optional mounting frame; and

Figure 8 is a schematic diagram illustrating the layout of the software interface that drives the system.

The overall assembly illustrated in the drawings comprises a computer control system, consisting of an interface unit and separately cased control and power supply units, and a series of individually cased device units of similar size and shape, which are detachably connectable to the interface unit.

Referring to Figure 1 the control unit 1 comprises a control unit board 2 packaged within a casing having a front panel 3, a rear panel 4, a top panel 6 and a bottom panel 7. The control unit 1 is provided with an electrical connector 5 for data and power connections to be made to the board 2, light indicators 8 and an on/off switch 9. The system includes a display (not shown) and an actuator (not shown), such as a keyboard and a mouse, permitting the user to interact with the system.

The control unit 1 is provided for controlling the various device units connected to the system, and, as shown diagrammatically in Figure 2,

incorporates a number of modules for this purpose. More particularly the control unit board 2 includes a microprocessor 10, memory modules 11, control modules 12 to 22, and control interfaces 23 and 25 for controlling transfer of data between the microprocessor 10, the memory modules 11 and the control modules 12 to 22, and between the control modules 12 to 22 and the electrical connector 5. The control modules comprise an analogue telephone line module 12, an ISDN line module 13, a radio communication module 14, a digital video module 15, a digital audio module 16, a television/cable receiver module 17, a home automation module 18, a disk controller module 19, a games interface module 20, a graphics card module 21, and configurable spare modules 22. A remote control sensor 24 is provided for receiving control signals from a user actuated remote control unit (not shown). Figure 3 shows an alternative design to the control unit board 2 whereby the control modules 12 to 22 in Figure 2 are replaced by PCMCIA flash module sockets 26 which permits the user to insert PCMCIA flash cards 28 and PCMCIA memory cards 27 in the control unit 1 through a flap 29 in the casing of the control unit.

Referring to Figure 4 the interface unit 30 includes a series of electrical connectors 31, each of which incorporates data input/output connections 32 and power connections 33. The interface unit 30 incorporates an interface board providing a connection bus by means of which power connections are made from the power supply unit to the control unit and the various device units, and control signals are transferred between the control unit and the power supply unit and between the control unit and the various device units. In addition the rear

portion 34 of the interface unit 30 incorporates a series of slots for receiving one or more I/O adapter cards which are individually cased and incorporate connectors which connect with complementary connectors within the slots 35 to establish electrical connections to the connection bus to permit transfer of data between the cards and the control unit. If necessary, interface unit extensions 36 incorporating further connectors 31 for connection of further device units may be connected to the interface unit 30 by appropriate connectors.

Referring to Figure 5 the power supply unit 40 comprises a power supply cube 41 and ventilation fans 42 packaged within a casing having a front panel 43 provided with an on/off switch 47 and a rear panel 44 provided with an electrical connector 45 for the input and output of control data and the supply of power to the entire system and a power socket 46 for connection of the power supply unit 40 to a mains power supply.

Figure 6 illustrates the connection of the control unit 1 and the power supply unit 40 to the interface unit 30 by way of the electrical connectors so as to provide a control system which is adapted to supply control signals and power to up to six device units connected to the interface unit 30 by way of the remaining electrical connectors of the interface unit 30. If one or more interface unit extensions 36 are connected to the interface unit 30, provision is made for the connection of additional device units to the control system. The electrical connectors at the rear of all the units are aligned one above the other and in such a manner as to be at the required levels in relation to the electrical connectors of the

interface unit 30. Since all the device units 70 are of the same size and shape they can easily be interchanged and upgraded, and there is no limitation on where each unit fits within the assembly provided that it can be connected to one of the electrical connectors of the interface unit 30 or the extensions 36.

Figure 7 shows an optional arrangement by means of which the system units are supported by a mounting frame 71. The power supply unit 40, the control unit 1 and the device units 70 may be inserted into the front of the frame 71, and one or more I/O adapter cards 72 may be inserted into the rear of the frame 71. The interface unit 30 will be inserted from the top of the frame 71.

Figure 8 shows a schematic layout of the software interface which drives the system. It consists of four families of devices, each with the appropriate buttons and icons to represent these devices, namely personal computer devices, which covers hard disk, floppy, printer, tape drive, CD ROM and scanner; communication devices, which covers telephone, telefax, modem, answering machine, ISDN and conferencing; entertainment devices, which covers television, cable, radio, hi-fi, video and games; and house automation devices, which covers light, heating, security, kitchen, air conditioning and other devices. Each of these buttons represent a device unit in the system and has an animated icon of the device. By clicking on a button, using a mouse or a keyboard, a menu of options will appear on the display permitting the user to interact with the device. For example, by clicking on the CD ROM button, the user will be presented with options such as open, save, play, format and configure the CD ROM disk drive.

The control unit 1 serves to implement control of the individual device units 70, the power supply unit 40 and the interface unit 30 by means of appropriate instructions transmitted from the individual control modules 12 to 22 to complementary control modules of the device units 70. The control module of each device unit is adapted to decode control instructions received from the control unit 1 so as to operate the device unit, for example to place the device unit in a receiving and/or transmitting mode or to increase or decrease the gain of the device unit where appropriate, as well as to control the input of data to the control unit from the device unit. The control module of each device unit ensures the input and output of data in the correct form to enable communication to take place between all the device units and the control unit.

The control unit 1 has three main functions, namely (i) the controlling of the various device units, (ii) the management of communications to and from each device unit, and (iii) the determination of the overall system performance and speed. The control modules 12 to 22 of the control unit 1 comprise programmable flash chips which store the logic required to operate and communicate with the various device units, and manage the flow of such instructions between the control unit, the device units and the power supply unit. Each control module provides a different protocol interface. For example the analogue telephone line module 12 is responsible for controlling any device unit which uses a telephone line, such as a telephone, a fax machine, a telephone answering machine, a modem, a call management device or a data conferencing device, and ensures that all such device units are capable of

communicating with each other and with other device units, such as a digital audio device so as to enable such a device to record, retrieve or edit audio signals received from the telecommunication device units.

The flash chips can take one of two forms, that is they can either be internal chips which plug into flash sockets within the control unit as in Figure 2, so that the control unit is supplied with a number of control modules already installed for the user, or alternatively they can be packaged in the form of PCMCIA flash cards which slot into the control unit externally to permit the user to add as many such cards as are required to control the particular system as in Figure 3. This second option provides the user with the flexibility of adding and removing control modules as required, thus keeping the overall cost of the system to a minimum and providing the user with the ability to upgrade the system. Since the flash chips or the flash PCMCIA cards are programmable, each control module can be programmed to perform the required device interface function, and can subsequently be reprogrammed if required to perform another device interface function. This permits the user to install a limited number of such control modules and to acquire an unlimited number of device interfaces to manage existing device units, as well as device units which may be added to the system in the future.

There is also the communication firmware, including the Home System Standard (HSS), which is resident in the control modules and the control chipset 23 and which is responsible for communicating instructions to and from each device unit. The HSS code creates a homogenous environment permitting

intercommunication between the various device units. In addition firmware resident in the control interface 25 is responsible for translating instructions passing between the various control modules and the microprocessor 10. For example, the control interface 25 may translate instructions received from the digital audio device by way of its associated control module 16 and the telephone by way of its associated control module 12 to pass an instruction to the microprocessor to compress and process a telephone message for recording by the digital audio device as a sound file on the hard disk.

In use of the system the control unit 1 receives signals from each device unit 70 indicating the mode of the device unit, that is whether it is switched on, whether it is receiving an incoming call or whether an engaged or ringing tone is received on an outgoing call (in the case of the telephone), whether it is in record or playback mode, etc. Generally each device, unit will be represented by a distinctive icon/button in the control software on the display, and this icon may be animated to indicate a particular mode of the device unit.

In order to save power each device unit is preferably controlled by the control unit so that it is in a stand-by mode when not in use. However, if required, each device unit may be provided with an on/off switch by means of which it may be manually turned on when required for use, or alternatively may be automatically turned on when plugged into the interface unit.

When data is received by the control unit 1 from one of the device units

70 such data may be processed within the microprocessor, either according to a predetermined processing program selected by the user or under user control. Programs for effecting such processing may be provided on secondary chips. The user may upgrade the control unit to provide further processing functions as required by the addition of the appropriate secondary chips for carrying out these functions. It is possible for two or more incoming signals received from separate device units to be processed in synchronism, for example so as to combine video and audio inputs. Each device unit preferably includes one or more indicators for indicating the mode of the device unit, and the control unit may also be adapted to provide an audible indication of certain device modes, such as receipt of a telephone or fax call.

Such a system can be assembled and upgraded by an average user without any requirement for installation or configuration of electronic devices, such as switches, jumpers or keys. Furthermore the control unit 1, which incorporates a standard computer microprocessor, contains all the logic and software necessary to drive the entire system, and the power supply unit 40 serves to supply power to all the other units.

CLAIMS

1. A computer control system comprising an interface unit having a plurality of electrical connectors for detachable connection to corresponding electrical connectors of a plurality of device units, a common control unit connectable to the interface unit for controlling the device units, and a common power supply unit connectable to the interface unit for supplying power to the device units, characterised in that the control unit incorporates telecommunication control means for controlling a telecommunication device unit by way of the interface unit, and audio/video control means for controlling one or more audio and/or video device units by way of the interface unit.

2. A system according to claim 1, wherein the control unit incorporates control means for controlling a data device unit, such as a hard disk drive unit, a floppy disk drive unit or a CD ROM unit, by way of the interface unit.

3. A system according to claim 1 or 2, wherein the control unit incorporates radio and/or television reception control means for controlling a radio and/or television receiver unit by way of the interface unit.

4. A system according to claim 1, 2 or 3, wherein the control unit incorporates home automation control means for controlling a home automation device unit by way of the interface unit.

5. A system according to any preceding claim, wherein the control unit

incorporates microprocessor means and/or memory means.

6. A system according to any preceding claim, wherein the control unit and the power supply unit are individually cased and are provided with external electrical connectors for separate detachable connection to corresponding connectors of the interface unit.

7. A system according to any preceding claim, wherein the connectors of the interface unit are spaced apart vertically to enable the device units to be supported at different heights.

8. A system according to any preceding claim, wherein the interface unit is provided with slots for the insertion of I/O adapter cards.

9. A device unit which is adapted to be supplied and controlled by a system according to any one of claims 1 to 8.

10. A control unit for a computer control system comprising an interface unit having a plurality of electrical connectors for detachable connection to corresponding electrical connectors of a plurality of device units, and a common power supply unit connectable to the interface unit for supplying power to the device units, characterised in that the control unit incorporates telecommunication control means for controlling a telecommunication device unit by way of the interface unit, and audio/video control means for controlling one or more audio

and/or video device units by way of the interface unit.

Figure 1

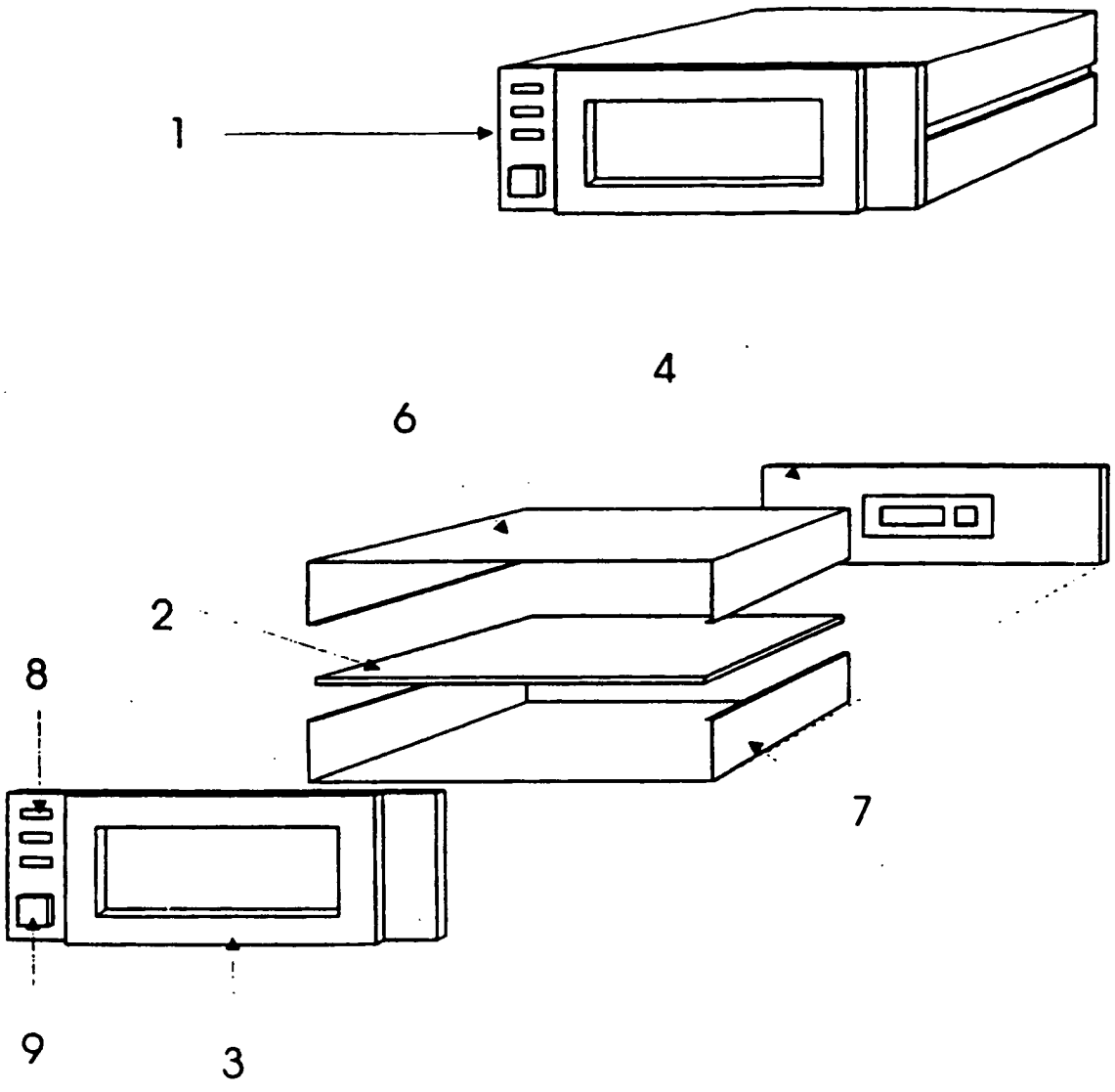


Figure 2

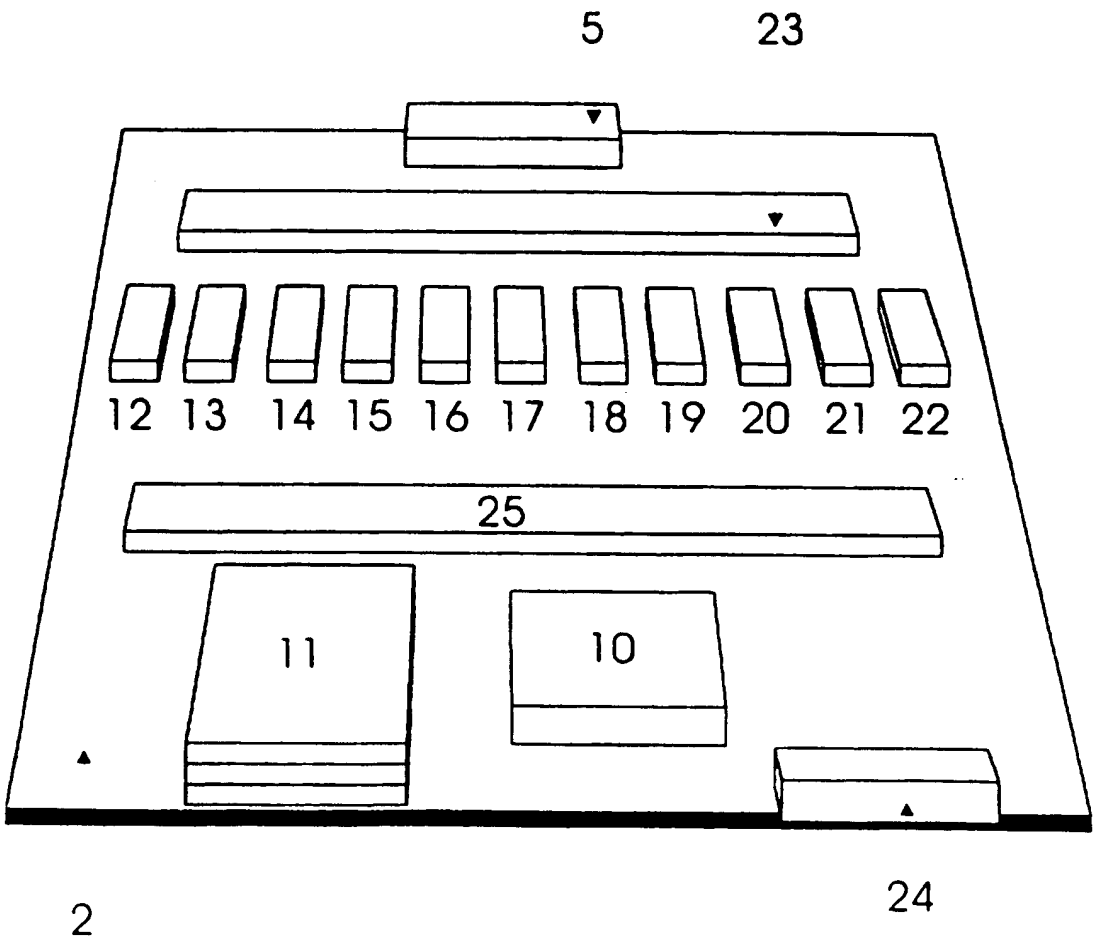


Figure 3

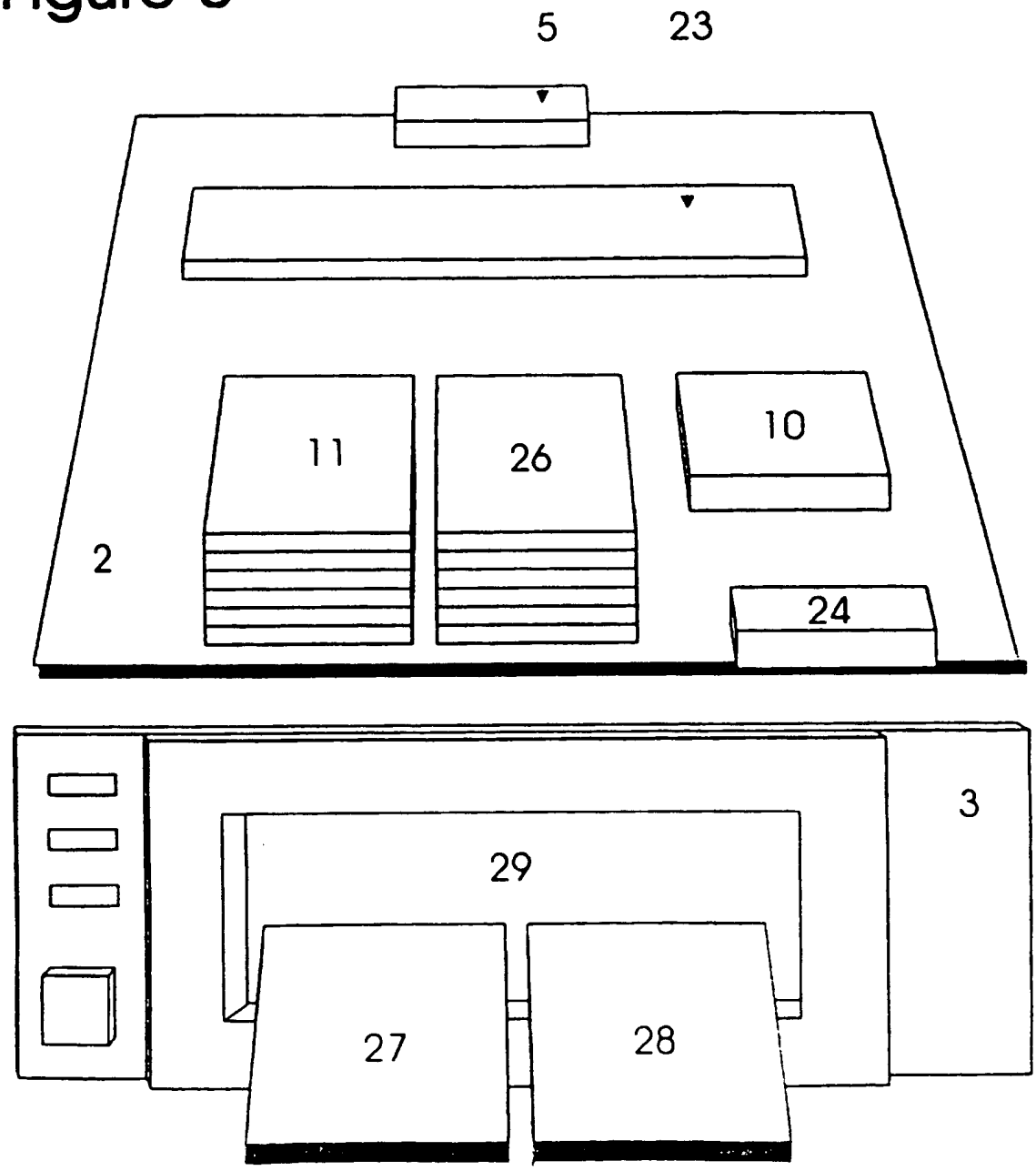


Figure 4

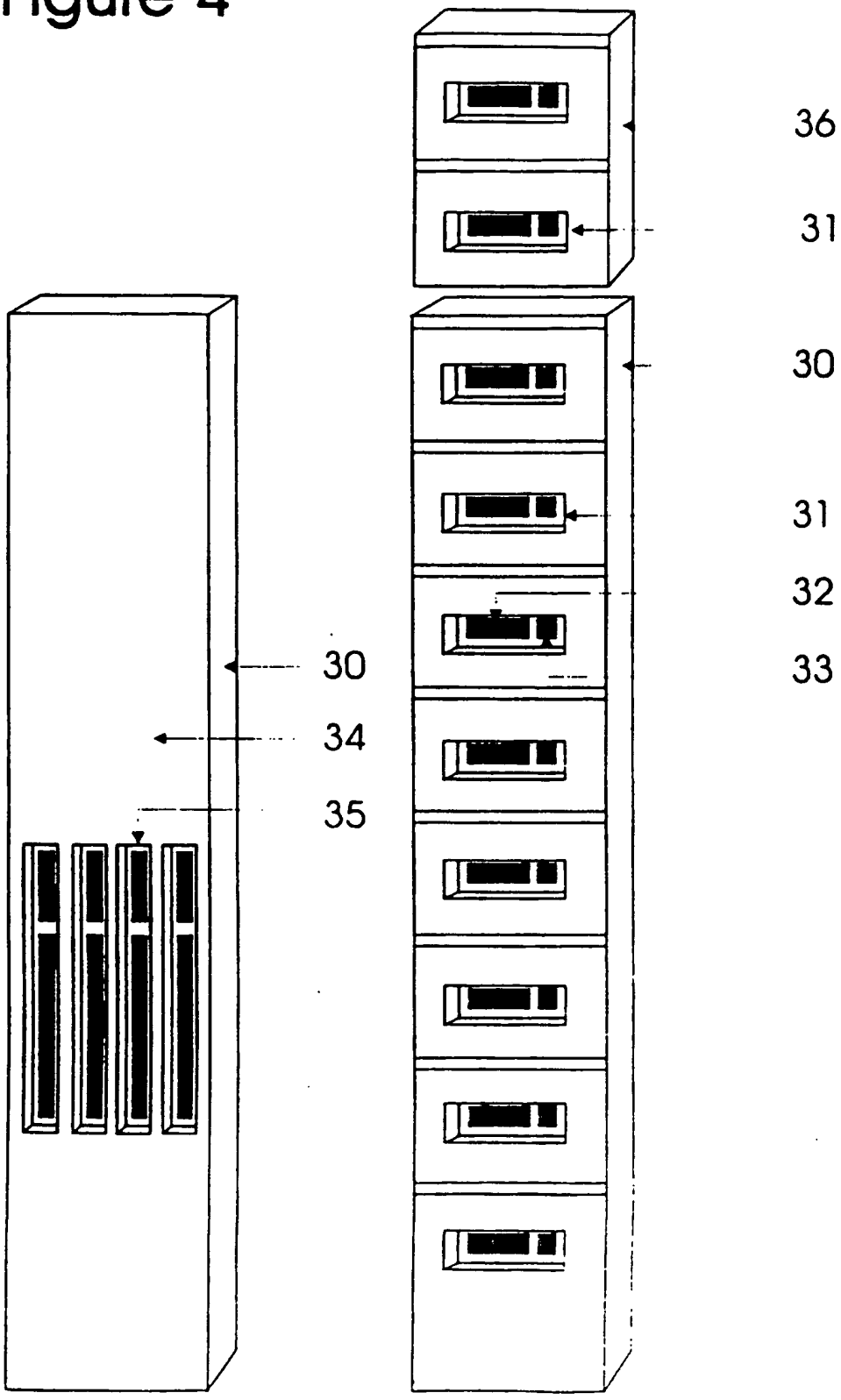


Figure 5

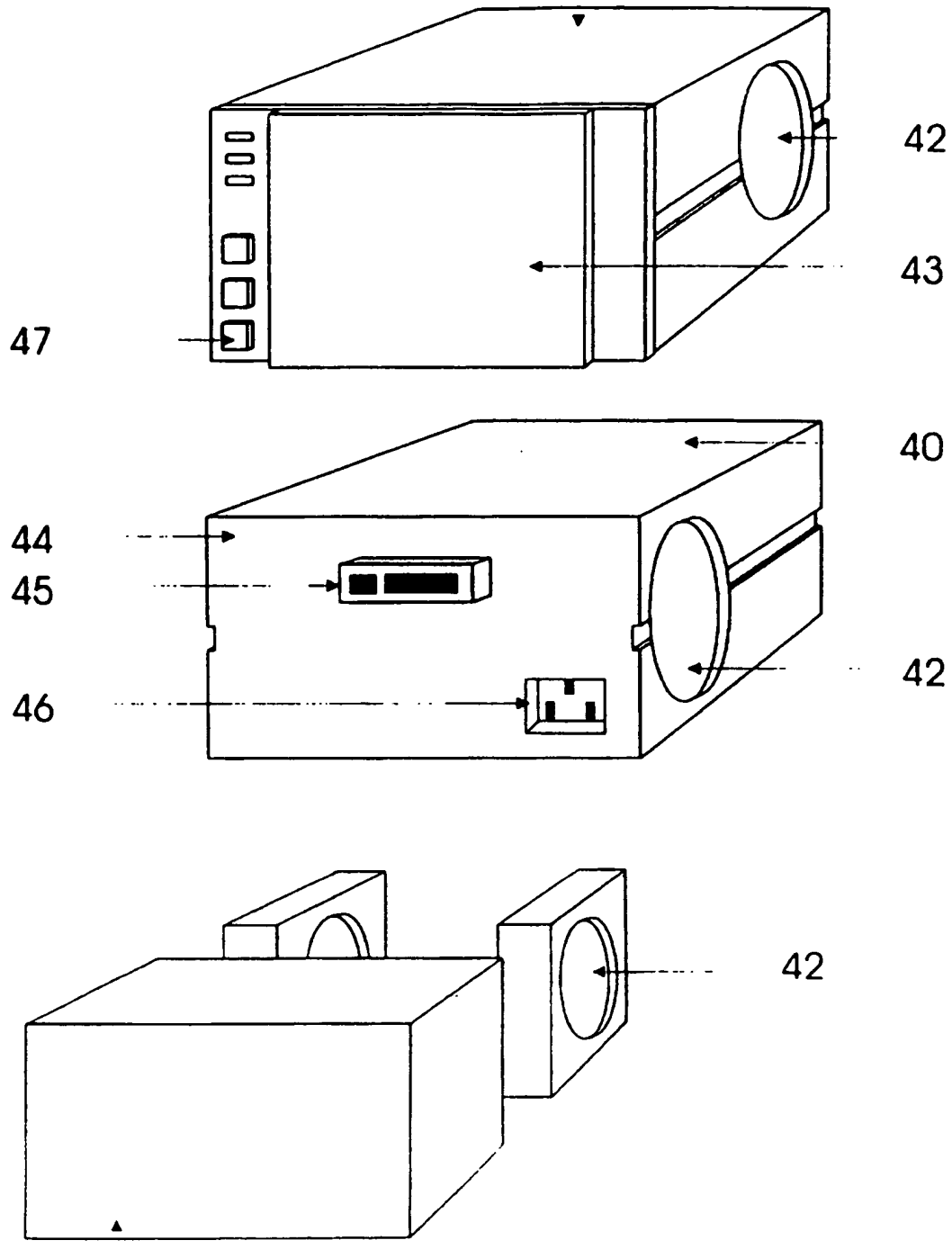


Figure 6

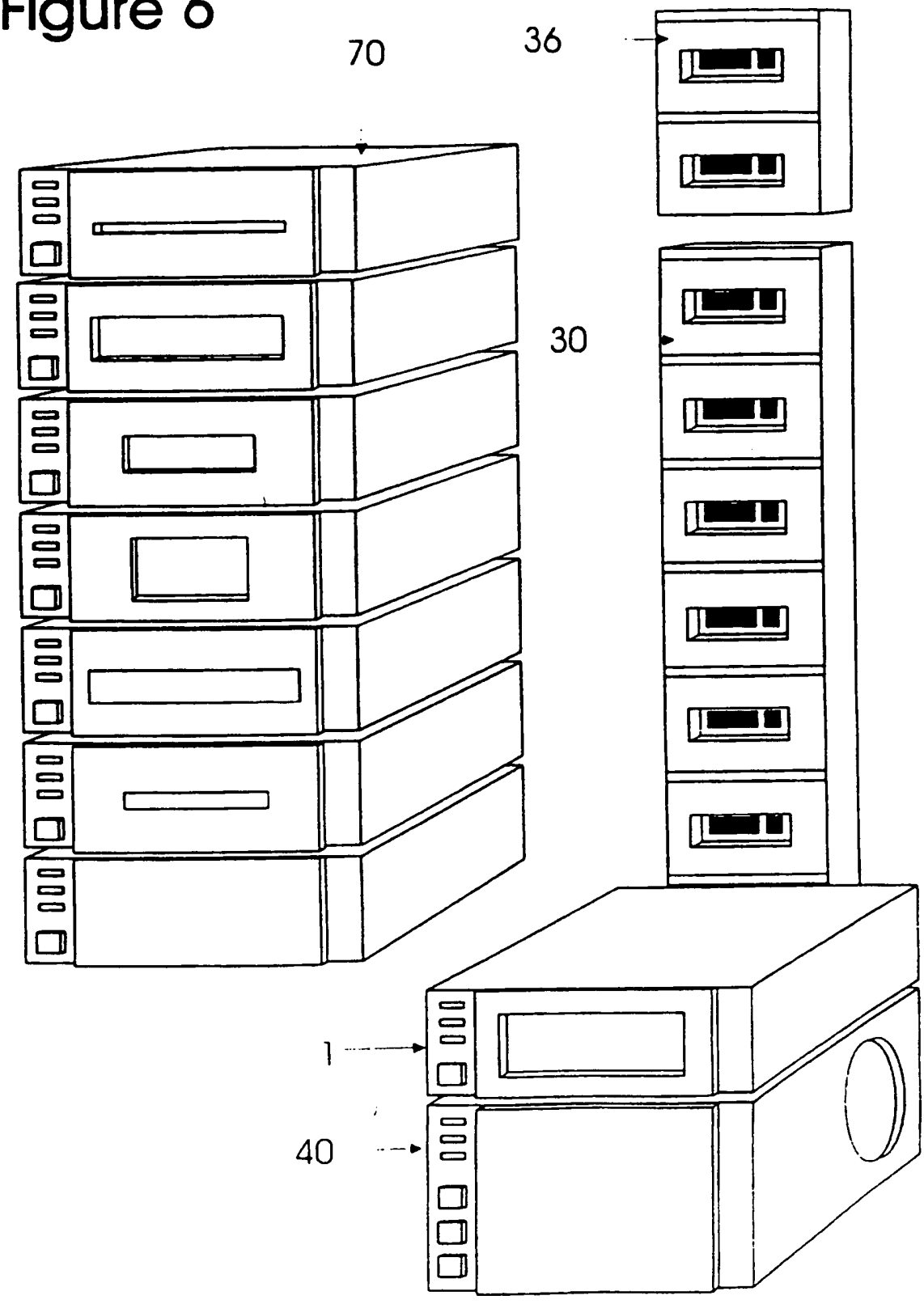
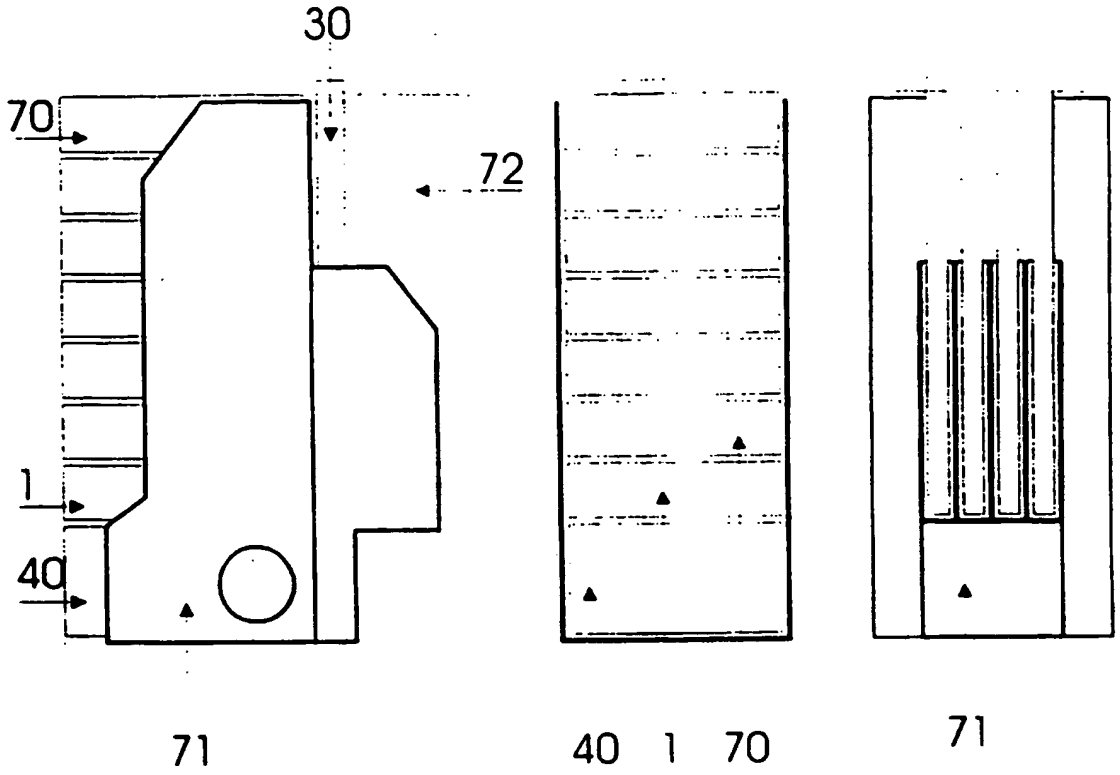
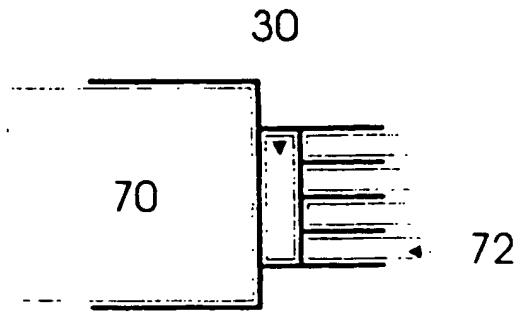


Figure 7





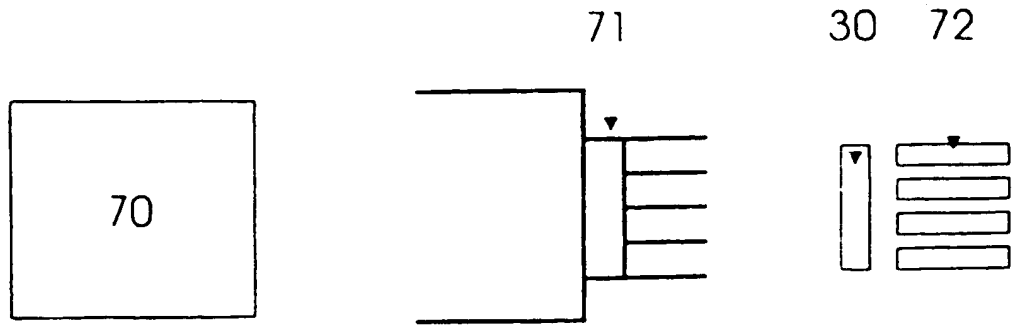
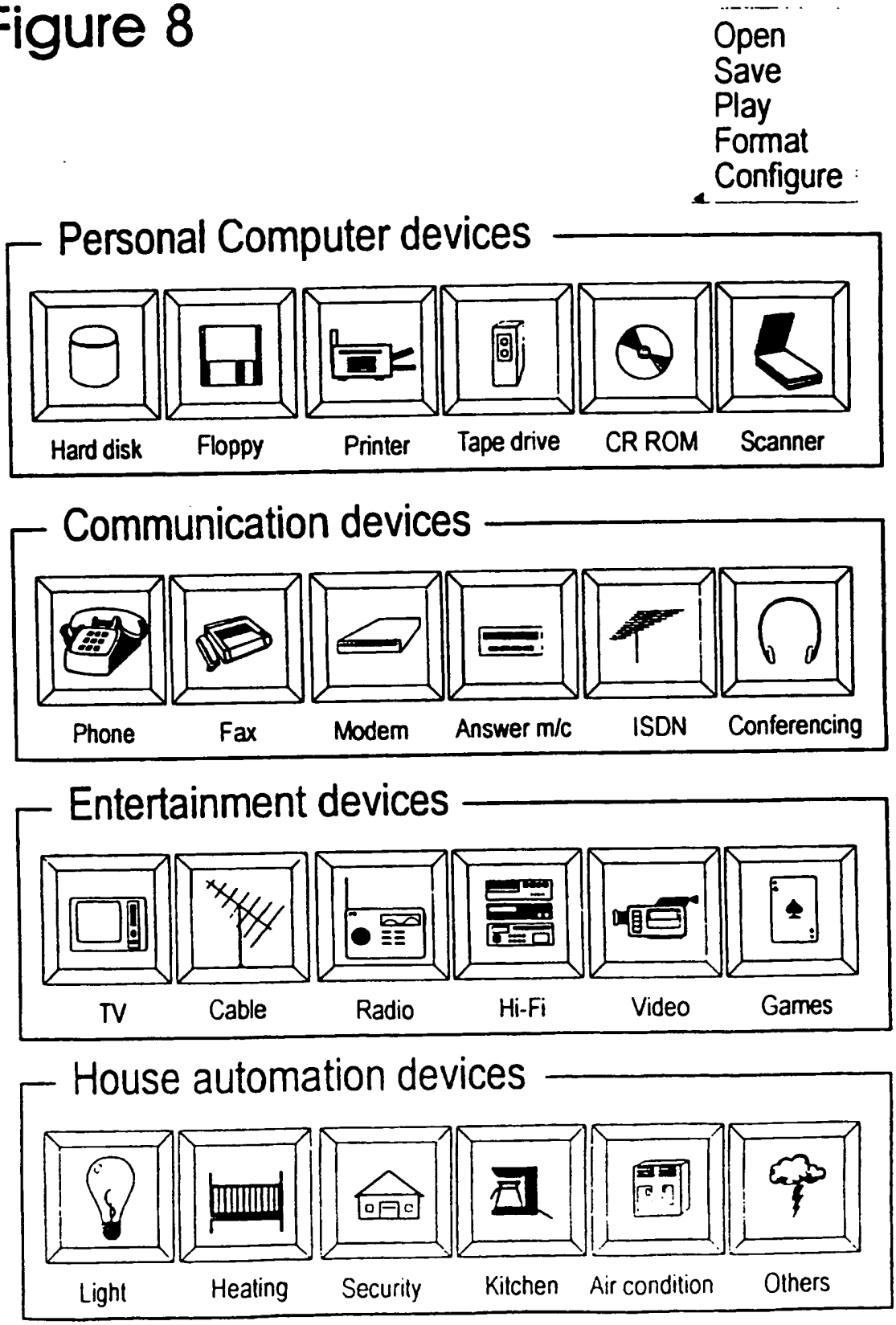


Figure 8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Games
House automation devices
Light
Heating
Security
Kitchen
Air condition
Others

INTERNATIONAL SEARCH REPORT

ational Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G06F1/18 H05K5/00

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Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 319 235 (SMART HOUSE L.P.) 7 June 1989 see abstract; figures 1-6 see column 3, line 11 - line 36 see column 5, line 45 - column 7, line 6 see column 11, line 2 - line 11	1-10
Y	WO,A,94 22102 (HT RESEARCH, INC.) 29 September 1994 see page 7 - page 10, line 18	1-10
A	EP,A,0 132 152 (DATA GENERAL CORPORATION) 23 January 1985 see the whole document	1

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[X] Further documents are listed in the continuation of box C.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	PATENT ABSTRACTS OF JAPAN vol. 14, no. 225 (E-0927) 14 May 1990 & JP,A,02 057 029 (FUJITSU GENERAL LTD) see abstract	1
A	EP,A,0 477 551 (B. BRAUN MELSUNGEN AG) 1 April 1992 see abstract	1
A	US,A,5 010 450 (WERDIN ET AL.) 23 April 1991 see abstract; figures 1-8	1
A	1994 INTERNATIONAL CONFERENCE ON CONSUMER ELECTRONICS, 21 June 1994, ROSEMOUNT, IL., USA pages 897 - 902 G. LEEB 'A USER INTERFACE FOR HOME-NET'	1-10

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Information on patent family members

International Application No
PCT/GB 94/02409

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